REMARKS

The application has been reviewed in light of the final Office Action dated June 26, 2007. By this Amendment, claims 1 has been amended to clarify the claimed subject matter, without narrowing a scope thereof and without introducing any new subject matter or new issues. Accordingly, claims 1-13 are presented for reconsideration, with claim 1 being in independent form.

Claims 1-13 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 6,307,368 to Vasanawala et al.

Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claim 1 is patentable over the cited art, for at least the following reasons.

This application relates to an improved approach devised by applicant for performing magnetic resonance imaging (MRI) which does not require presaturation or special control of gradient magnetic field pulse, as typically found in conventional techniques, by performing specific irradiation phase control for the RF magnetic field, for effective selection of a field of view.

In particular, independent claim 1 is directed to a magnetic resonance imaging apparatus comprising RF transmitting means and an RF irradiation control means for controlling irradiation phase of the RF magnetic field, wherein the RF irradiation control means controls RF irradiation so that a RF excitation pulse is applied with a phase of the second half of the RF pulse waveform after the temporal center of the RF pulse being different by 180° from the phase of the first half of the RF pulse waveform. Such phasing of a RF excitation pulse is shown by Fig. 7 of the application, and the excitation profile is shown in Figs 8a through 8c. Fig. 6 of the application

shows a sequence based on a typical gradient echo method, and does not show the irradiation phase control of the present invention.

Vasanawala, as understood by Applicant, proposes a spectrally-selective, steady-state free precession (SSFP) technique in MR imaging wherein selected sequences of RF excitation pulses are applied to produce an equilibrium magnetization that fluctuates between several values.

Fig. 3 of Vasanawala (is reproduced below), which was cited in the Office Action, is a timing diagram for a standard SSFP sequences:

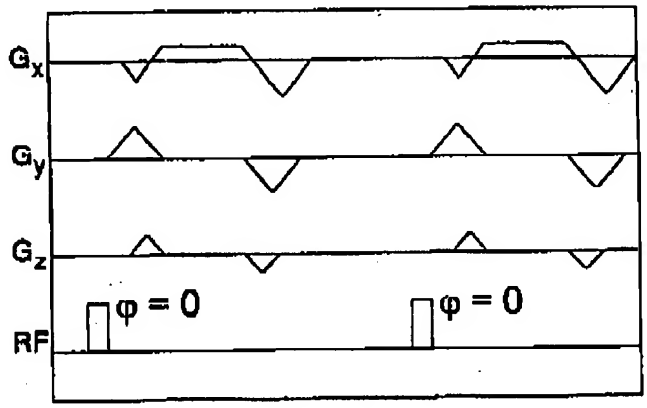

FIG. 3

Vasanawala, column 4, lines 51-60, states as follows:

> A standard SSFP sequence is depicted in FIG. 3, which is a ***timing diagram for two phase encoding steps of a 3D free precession sequence***. Note that magnetization is completely rewound over a repetition time, TR. Although ***the two RF phases are zero in the diagram, a linearly increasing phase from excitation to excitation also constituted an SSFP sequence. After every RF excitation, phase encode gradient and data acquisition, spins are completely rephased*** with refocusing gradients on all three axes.

Thus, the waveform RF in Fig. 3 of Vasanawala shows ***two RF excitation pulse, with each pulse having a phase of zero.*** As pointed out in Vasanawala, in each sequence of RF pulses, the phase can be varied between one pulse and the next pulse.

However, Fig. 3 of Vasanawala does not show or suggest varying a phase of a second half (that is, after the temporal center) of the RF pulse by 180° from the phase of the first half of the RF pulse.

Waveforms G_x, G_y and G_z in Fig. 3 of Vasanawala represent gradient magnetic field waveforms, not excitation pulses.

The LCSSFP (Linear Combination Steady-State Free Precession) MRI of Vasanawala is directed to spectrally-selective imaging, where species having different resonance frequencies (e.g., water and fat) are separated.

In contrast, the subject matter of claim 1 of the present application is directed to spatially-selective imaging, where the spatial region of the object is selectively excited and imaged. Such technique is quite different in objectives, means and effects from the LCSSFP approach of Vasanawala.

Moreover, in the LCSSFP of approach of Vasanawala, the phases of RF pulses can be controlled so that the phases of the pulse sequence are cyclically changed. For example, in imaging with sequences of excitation pulses, the phases of successive RF pulses in a sequence of a first type are set to be 0°-0°-0°-0°, respectively, and the phases of a sequence of successive RF pulses of a second type are set to be 0°-90°-180°-270° and thus the phase is changed cyclically in this order in the second type of sequence. Further, in third and fourth types of sequences, the phases of RF pulses are set to be 0°-180°-0°-180°, and 0°-270°-180°-90° and the phase is changed

cyclically. However, none of the phase change types proposed by Vasanawala involves phase change in a single RF pulse. Instead, in each instance of phase change in Vasanawala, the phase change is between one RF pulse and another RF pulse in a series of plural pulses.

The graphs illustrated in Figs. 4A and 4B of Vasanawala, as implicitly acknowledged in the Office Action, show the ***responses*** to the excitations and do not show the RF pulse waveform.

Figs. 4A and 4B of Vasanawala, contrary to the contention in the Office Action, does not illustrate the phases of the 1st and 2nd halves of the RF pulse waveform.

The cited art simply does not teach or suggest a magnetic resonance imaging apparatus wherein a RF irradiation control means controls RF irradiation so that a RF excitation pulse is applied with a phase of the second half of the RF pulse waveform after the temporal center of the RF pulse being different by 180° from the phase of the first half of the RF pulse waveform, as provided by the subject matter of claim 1 of the present application.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claim 1 and the claims depending therefrom are patentable over the cited art.

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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